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IDARA (INSTITUTING WATER DEMAND MANAGEMENT IN JORDAN)

Task 3.4 – Implement Best Management Practices in Pilot Areas

Concept Paper for Pilot Implementation Strategy

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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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I. Background

Under Task 3.4 “Implement best management practices in pilot areas”, IDARA will work with WDMU, Miyahuna, AWC and NGWA to develop pilot implementation strategies for some of the Best Management Practices (BMPs) developed under Activity 1 and then cooperate with one of the utilities (Section C Task 3.4) to implement these pilot BMPs. After implementation, the pilot programs will be evaluated to capture lessons learned so that future implementation of similar projects can benefit from the experience of this pilot program. After the evaluation is complete, results will be reported for the benefit of utilities and customers, to encourage them to develop programs to assist customers in implementing these water efficiency measures.

In the meantime, IDARA has developed the following BMP guidelines for Residential-uses in addition to the following categories of major water institutional and commercial (IC) uses in Jordan:

- Hotels
- Hospitals
- Offices
- Landscapes
- Public Information and Outreach

In addition, in November, 2008, IDARA consultants conducted end use analysis for residential users (apartments, houses and villas) and audits for IC customers in the following categories;

- Hotels
- Hospitals
- Offices
- Schools & Universities
- Mosques

More than 50 staff from the private sector and utilities were trained on the implementation of end use analysis where they developed awareness on opportunities for water saving in the aforementioned categories.

II. Pilot Programs Identified

Based on the measures identified BMP guidelines and the recommendations from the experts conducting the IC audits and the residential end use analysis, the potential water efficiency measures were identified. The criteria used to select these measures included the following:

- Scalability of the measure (The measure can be expanded such that more customers can benefit from it).
- Potential and likelihood of savings.
- Potential interest in the measure.
- Feasibility of implementation of the measure for the utility and the customer.
- Applicability and acceptability.
- Availability of the technologies in Jordan.

Two potential ideas for pilot programs demonstrations will be discussed in detail, specifically;

- End use analysis and demonstrating water efficiency measures for residential use.
- Sub-metering and demonstrating water efficiency measures for hotels, hospitals and universities.

1. End use analysis and demonstrating water efficiency measures for residential use.

Under the scope of Task 1.4; residential end use analysis study was completed for pilot dwellings in Amman and Aqaba in November of 2008. The pilot study identified a number of concepts, if implemented would lead to more efficient use of water in the residential sector, and reduce the consumers water billed amounts. Within the same task IDARA will be expanding the said study to include a larger statistically representative sample to obtain specific data on the end uses of water (*showers, bathroom faucets, kitchen faucets, toilet flushing, clothes washer, dishwasher, irrigation and leaks*) in residential settings across the country, identify variations in water use for each fixture or appliance, in addition to current and potential use.

A major finding of the pilot study was that a number of potential water efficiency measures could be implemented in residences. However the actual savings that would be achieved has not been determined for Jordanian residences.

Moreover, the preliminary results of the pilot retrofit program¹ that was implemented in Abu Nuseir Housing complex showed that potential for water saving for the retrofitted residential units took place. However information on water use duration and frequency is needed to obtain accurate percentage of these savings.

In view of the above; IDARA is proposing to carry out the pilot demonstration program in conjunction with the end use analysis task mentioned above. The pilot program will consist of two phases; first phase includes estimation of baseline water use. Whereas the estimation of benchmark water use comes in the second phase. The latter would be done through applying water efficiency measures. A subset of the sample from the population selected for the implementation of the representative residential end use study will be considered for the two-phase pilot program. The baseline end use analysis is aimed at estimating current water use pattern in residences to establish baseline information for end uses prior to the retrofit. While the benchmark phase includes post retrofit end use analysis for a number of retrofitting options to set a ceiling for potential water saving and consequently assessing the effectiveness of the conservation measures.

1.1. Objective

This pilot demonstration program is aimed at assessing the effectiveness of individual water efficiency measures through pre and post retrofit end use analysis thus determining the corresponding potential saving through baseline and benchmark end use analysis, in addition to evaluating the acceptability and applicability of each measure. Moreover the program will facilitate adoption of new technologies to use water more efficiently.

1.2. Approach and Methodology

1.2.1. Baseline Information

Baseline information consists of the following;

- Customer name and contact details and coordinates.
- Subscription number, quarterly billed water consumption.

¹ Within the pilot retrofit program water saving devices were installed on bathroom and kitchen faucets in addition to showerheads.

- Billed amounts in JD's.
- GIS maps.

1.2.2. Sample Selection and Selection Criteria

As mentioned in section 1, the subset sample for the pilot demonstration retrofit program will be selected from the sample selected for the implementation of the representative residential end use study. For demonstration purposes, the size of the sample would not exceed 30 dwellings. Selection will be based according to the water consumption and potential water saving targeting high water consumption categories.

1.2.3. Implementation of the Pilot Program

Team: IDARA in collaboration with WDMU and utility staff will conduct the study.

Notification of customers: Prior to the start of the survey; and as part of the end use analysis task a national public campaign is envisaged through media outlets. The campaign is intended to introduce the end use analysis and retrofit activity and explain its objective, anticipated benefits and impact on water consumption.

Conduct Survey and end use analysis:

A reconnaissance visit to the selected residences will be made to ensure;

- Residents are willing to participate.
- The residence has been occupied at least during the last year.
- No construction took place during the year under consideration and no renovation is planned during the study period.
- Water use appliances identified (dishwasher, clothes washer).
- Status of rooftop tank, and condition of connecting valves and water pipe.
- Water meters are accurate and well functioning.
- Plumbing fittings and fixtures are well functioning.
- External network and system information including hot and cold water systems.

Based on the above a final survey sample will be identified. Following that, the final list of residential units will be audited before the installation of meters. Type of data to be collected during the survey includes;

- General Information about the customer and the residence.
- Household demographics.
- Water supply and storage information.
- Availability of dishwashers and semi automatic/automatic clothes washers.
- Water meter information.
- Internal water use data.
- External water use information.

Baseline end use analysis

IDARA project will install meters and data loggers after the rooftop tanks of the selected residential units to obtain precise data on end uses of water inside the selected residential units. Each house will be metered and the meter reading will be recorded by data loggers. It is expected that the corresponding metering period will last from 7 to 14 days each.

Benchmark end use analysis

IDARA project will implement one or more of the following efficiency measures in the selected residential units;

- Replace toilets that use more than 9 liters per flush by either new toilets or new flushing devices.
- Install water efficient faucet aerators.

Following that a post retrofit end use analysis will be conducted in order to demonstrate water use pattern after conducting the retrofit. Likewise the metering period will last from 7 to 14 days.

1.3. Evaluation of the Pilot Program

IDARA will conduct an evaluation of each pilot program retrofit. The evaluation will include determining the actual in-house water use patterns, percentage distribution of end uses within the house before and after the retrofits, in addition to reduction in water use and customer satisfaction about the pilot program.

All baseline and benchmark information collected during the study will be considered as part of the Water Use Information Program, and will be included in the relevant tables of the GIS based water demand management database to be developed under the project.

1.4. Results

The results will be presented to MWI, WAJ, Miyahuna, AWC, NGWA, the private sector and other stakeholders to encourage them to develop programs to assist customers in implementing these water efficiency measures.

2. Sub-metering and demonstrating water efficiency measures for hotel, hospitals and universities.

Based on the findings of the institutional and commercial IC water audits, it was concluded that hospitals, hotels and universities do not sub-meter the building water use for specific areas such as kitchens, laundries, boilers, irrigation, etc. and therefore do not have the data they need to accurately manage water use.

2.1. Objective

Metering and sub-metering alone does not reduce water use, but it is a key to identifying water use by type of activity and more importantly, identifying leaks and other operational problems within the IC facilities. This pilot program is intended to assist the managers of the facilities (hospitals, hotels and universities) to better understand water use pattern, demonstrate the importance of sub-metering in identifying significant water use areas within the facility, and produce the data necessary to determine the impact of water efficiency measures, and assess potential impact for water use reduction. Moreover the program will facilitate the adoption of water efficient measures in the IC sector.

2.2. Approach and Methodology

2.2.1. Sample Selection and Selection Criteria

Select one hospital, one hotel and one university that were part of the IC water audits who are interested in participating in the program.

2.2.2. Implementation of Pilot Program

Team: IDARA in collaboration with WDMU, utility staff and the facility maintenance manager will conduct the pilot program.

Notification of customers: Prior to the start of the program; the targeted facility will be officially notified of the program and its objectives, anticipated benefits, and potential savings in water bills.

Data collection

Type of data to be collected during the implementation is as follows;

- IC customer common name and contact details and coordinates.
- Subscription name and number.
- Quarterly billed water consumption for at least three years including tankers.
- billed amounts in JD's
- Census and occupancy data.
- Type of equipment in each water use area.
- Food activities information.

Conduct pilot program:

IDARA project will carry out the pilot program in two phases; the first phase consists of sub-metering specific areas within the facility, whereby the following water use areas would be metered for one to two weeks.

- **Hotels, Hospitals and Universities:** central laundries, commercial kitchens, boilers including blow-down, cooling towers, irrigation, pools and water features, water treatment systems, private bathrooms(if practical), and public bathrooms.
- **Hospitals:** kidney dialysis RO units, laboratory RO units, sterilizers.

During the second phase water efficiency measures, based on the recommendation of IC water audit conducted in November 2008, will be implemented and using the pre-installed meters for one to two weeks, the effectiveness of the selected measures will be evaluated.

Potential measures

Potential measures that will be considered for implementation include:

- For Hotels, Hospitals and Universities
 - Install water saving devices on bathroom faucets taking into consideration water use behavior.
 - Install pressure reducing valve on commercial dishwashers in order to control the water volume coming out of the nozzles
 - Install conductivity controllers on boilers for automatic blow-down control.
- For Hospitals
 - Use reject water from the kidney dialysis RO units to be used for laundry wash water or irrigation.

2.3. Evaluation of the Pilot Programs

IDARA will conduct an evaluation of pilot program. The evaluation will include determining the effectiveness of the selected measures, in addition to evaluating the acceptability and applicability of each measure by the targeted facility.

2.4. Results

The results will be presented to MWI, WAJ, Miyahuna, AWC, NGWA, private sector, facilities representatives, and other stakeholders to encourage them to establish programs to assist customers in implementing these water efficiency measures.

All baseline information and data collected during the study will be considered as part of the Water Use Information Program, and will be included in the relevant tables of the GIS based water demand management database to be developed under the project.